UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

March 24, 2011

Reply to
Attn Of: OEA-095

MEMORANDUM

SUBJECT: Risk Evaluation for Activity-Based Sampling Results, Sumas Mountain Asbestos Site, Whatcom County, Washington, Revision 1.1

FROM: Julie Wroble
Region 10 Toxicologist

TO: Elly Hale
Remedial Project Manager

Introduction

This memorandum presents a summary of the results of a risk evaluation using activity-based sampling data collected by the U.S. Environmental Protection Agency (EPA) at the Sumas Mountain Asbestos site. EPA is concerned about exposures to asbestos at this site because inhalation of asbestos fibers has been associated with several diseases including mesothelioma, lung cancer, asbestosis, and pleural changes.

The risk estimates presented in this memorandum include only intermittent activities that individuals who live near the Sumas Mountain Asbestos site may participate in. These individuals may include residents, farmers, and farm workers who live and/or work near flood impacted areas along Swift Creek and the Sumas River. It is possible that individuals are exposed to asbestos from flood deposits or dredged materials in ways that are not addressed in this document. Actual exposures could be higher or lower than those estimated herein.

This risk evaluation does not address soil or surface water samples collected as part of the field work conducted in August 2010. This is because asbestos presents a health risk primarily when inhaled into the lungs. Activity-based sampling is the tool used to assess inhalation exposures to asbestos released from soil into the air.

Printed on Recycled Paper

Activity-Based Sampling Objectives

The sampling team dressed in appropriate personal protective equipment performed outdoor activities similar to those conducted by residents and farmers to estimate the concentration of asbestos fibers in their breathing zone. Activities were conducted in areas where flood deposits or dredged material from Sumas River were present. Further, the levels of fibers measured in air were combined with information regarding exposure to calculate potential excess lifetime cancer risks associated with specific activities. The activities conducted included excavating and moving sediment deposits using a shovel and wheelbarrow; spreading sediment deposits into loafing pens at a farm; yard work (including raking and mowing); and walking around the properties. EPA conducted the activity-based sampling consistent with the Quality Assurance Project Plan (QAPP) developed for the site (EPA 2010a).

Sampling Procedures

The Activity Based Sampling Plan (EPA 2010b) contains a detailed description of how sampling was to be conducted. During each activity, the participants wore level C personal protective equipment (PPE). Level C PPE means that workers had respirators to protect them from inhalation hazards (i.e., asbestos) and they wore disposable coveralls with hoods and gloves to protect them from contacting materials directly. For each activity, more than one sample was collected. This was generally done by having an additional field team member performing the activity concurrently. Sometimes, an additional pump was placed on a field team member to collect an additional sample of the same activity.

Excavating and Moving Sediment Deposits Using a Shovel and Wheelbarrow. This activity was designed to assess asbestos exposure to an individual moving sediment deposits from a location near Sumas River to another location on their property at Location 1. The study area was roughly a 40-foot by 40-foot square-shaped area south of the Sumas River and about 40 yards east of Telegraph Road. Past flood events have deposited large quantities of sediment in this area. The landowner typically uses this sediment to fill pens in his loafing shed. During this activity, one participant shoveled flood deposits along the riverbank into a wheelbarrow and dumped the material out in a different part of the study area. This process was repeated for approximately 150 minutes. Concurrent stationary air samples were collected from the corners of the study area.

Spreading Sediments in Loafing Pens. This activity was designed to assess asbestos exposure to a farmer spreading sediment deposits in the pens of a loafing shed at Location 1. The farmer cares for 38 heifers and routinely puts sediment into the pens. When it is kicked out or soiled by the animals, the farmer spreads the soiled material on fields. During this activity, two field team members shoveled material (e.g., sediment deposits) from a pile in the shed into individual pens. The dimensions of the loafing shed were about 80 feet by 40 feet. The study area was delineated with yellow caution tape during the activity. The

duration of this activity was approximately 150 minutes. Stationary air samples were collected inside and just outside of the shed.

Yard Work. This activity was performed at two properties and was designed to simulate various gardening or yard work activities that residents and farmers may conduct on their properties. At the first property (Location 2), one field team member mowed the lawn while another field team member was raking nearby. At the second property (Location 3), two field team members raked in an area where flood deposits were present on the ground surface. In each case, the sampling team consisted of two individuals. The duration of this activity was approximately 2 to 3 hours in duration. Stationary air monitoring samples were collected from the corners of the areas where this activity was conducted.

Walking. This activity was performed at two properties and was designed to simulate an individual walking around their property. Walking was the least aggressive of all the activities conducted during this field event. However, soil sampling also was performed during the activity, so a brief period of direct soil disturbance did occur. Two field team members walked around the property. At Location 1, the sampling team walked from the command zone, across a pasture, to a drainage ditch where a soil sample was collected. The remaining time was spent walking around the property, primarily in the large pasture areas. At Location 2, the sampling team walked between the bank of the Sumas River and a corn field where flooding occurred in 2009. Similar to location 1, part of the walking activity included collection of soil samples from this part of the property.

Stationary air monitoring samples were not collected during the ABS for walking because the activity occurred over a relatively large area at each location.

All Activities. The field sampling team members dressed in appropriate PPE and wore personal pumps (see the Site Safety Plan, Appendix C to the Activity-Based Sampling Plan [EPA 2010b]). Samples were collected on 0.8-micron pore size mixed cellulose ester filters fitted into standard sampling cassettes. In some cases, a field team member wore two pumps so that duplicate samples could be collected. Pumps were generally run at a flow rate of about 2.5 liters per minute (lpm). However, it was raining slightly at the last property, so there was less of a concern for overloading the filters. For this reason, at Location 3 the pumps were run at a flow rate of between 3 and 4 lpm. Table 1 in the Environmental Monitoring Report (EPA 2011) presents the actual flow rates and activity times; total volumes are calculated from these site- and activity-specific measurements. In two cases, duplicate samples were analyzed. The duplicate samples generally showed good agreement with the initial samples (with a factor of 2, see Tables 1 and 2).

Stationary samples were collected to determine air concentrations of asbestos near where activities were conducted using medium high-volume samplers placed around the study area. These samples were collected for between 3 and

3½ hours (for about the same duration as the ABS activities) at a flow rate of between about 5 and 6 lpm. Table 1 in Environmental Monitoring for Asbestos (EPA 2011) shows the actual flow rates, sampling times, and sample volumes.

Analytical Methods

ISO 10312 (Direct Method) TEM results were available for all but 4 out of 19 ABS samples and 2 out of 19 stationary samples. This method counts all fibers detected greater than 0.5 microns in length. Samples that were determined to be overloaded (greater than 25% of the filter is occluded) were analyzed using ISO 13794, the indirect TEM method for identification of asbestos.

All air sample data described below use phase contrast microscopy equivalent (PCME) fibers as the metric of interest. PCME fibers are the category of fibers most commonly used to assess health risk and include asbestos fibers or bundles that measure greater than 5 microns in length, have a width of between 0.25 and 3 microns, and an aspect ratio of greater than or equal to 3-to-1. In accordance with current EPA policies, EPA uses the PCME fiber definition as presented in IRIS (http://www.epa.gov/iris/subst/0371.htm) to assess health risks posed by asbestos. However, the scientific community is currently investigating alternate fiber definitions and toxicity values to assess cancer risk.

Results

Table 1 shows the results of personal air (ABS) samples for each of the three locations and various activities conducted as part of this field event. The table provides individual results for each activity in units of PCME asbestos structures per cubic centimeter (s/cc). Table 1 also presents the average concentration (both as arithmetic average and pooled mean) for each activity. The pooled mean is obtained by grouping exchangeable samples (i.e., those that can be used to represent the same exposure condition, for example, the same activity at the same location) together and taking the total number of PCME fibers in these samples divided by the total volume of air analyzed for these samples. Some statisticians believe the pooled mean is a better estimate of the average exposure for asbestos data; however, use of the pooled mean versus the straight mean did not have a large impact on the results. Consequently, the straight mean was used in this risk evaluation.

Table 1 results are presented as both “Hi Mag” and “Low Mag.” “Hi Mag” samples are those that were viewed with the TEM using a magnification of about 20,000x. “Low Mag” samples were viewed with the TEM at a magnification of about 1,200x. Low magnification was performed so that a larger area on each filter could be viewed and hence a larger number of PCME fibers could be counted. This resulted in better analytical sensitivity and greater confidence in the results. The low magnification results appear to better represent the concentration as there is better agreement between the arithmetic mean and the pooled mean for the 6 ABS activity/location sets of samples.

At Location 1, ABS sampling results are available for 4 iterations of the excavation/moving/spreading sediments and 2 iterations of the walking activity. Four stationary air samples were collected from around the area where excavation and moving was done and 3 stationary air samples were collected from in or near the loafing shed. No associated stationary samples were collected for the walking activity because the area over which the walking occurred was very large.

At Location 2, ABS sampling results are available for 3 iterations of raking/mowing near the house and 3 iterations of raking/mowing near the shed along Gillies road. Four stationary air samples were collected from each of the Location 2 raking/mowing areas. At Location 2, an additional 3 ABS samples were collected for the walking activity. No associated stationary samples were collected because the area over which the walking occurred was very large.

At Location 3, ABS sampling results are available for 4 iterations of the raking activity. Four stationary samples were collected around the perimeter of where the ABS activity was conducted. A second ABS activity was not conducted at Location 3 because of light rainfall during the morning.

Table 2 shows the results of stationary air samples for the three locations. These results were not used to estimate risks to individuals, but may be used to determine air concentrations of asbestos adjacent to where the activity was conducted. Again, results are provided as PCME fibers.

Table 3 presents assumptions about the frequency and duration of various activities that might be undertaken by individuals who reside near Swift Creek or contact material from Swift Creek. The frequency and duration of exposure information in Table 3 is used to generate a time-weighting factor, to relate intermittent exposures to excess lifetime cancer risk. The time-weighting factor provides an estimate of the fraction of a year during which the exposure occurs. EPA previously developed these time-weighting factors for the area along Swift Creek in consultation with the Washington State Department of Health and the Agency for Toxic Substances and Disease Registry. More site-specific information from discussions with landowners was incorporated into this set of TWFs. Additional information about how these time-weighting factors were derived is included in Appendix A.

Excess lifetime cancer risk estimates were generated by combining information about exposure with a potency factor for asbestos (see Table 4). EPA currently uses the potency factor from EPA's Integrated Risk Information System (IRIS); the unit risk value is 0.23 per PCM fibers per milliliter (ml). Appendix E of EPA's Framework for Investigating Asbestos-Contaminated Superfund Sites (EPA 2008) provides the unit risk value using a lifetable approach. The lifetable approach applies greater weight to exposures that occur early in life. If an individual is exposed by more than one of the activities presented in Table 4,

then the risks could be summed to give an estimate of their combined activity-associated risk.

The low magnification ABS results presented in Table 1 were used to estimate risk for site exposures. For each activity that was performed at the site, an arithmetic mean, pooled mean, and maximum concentration value were determined. The arithmetic mean is the average of concentration values for a given location/activity dataset. The pooled mean is derived from the total number of fibers in all samples divided by the total volume of air that passed through the filter area analyzed for these samples. These three concentrations (arithmetic mean, pooled mean, and maximum) were used in the risk estimation process; however, only the arithmetic mean and maximum results are presented and discussed here. The various types of ABS were matched to comparable types of exposure for the risk evaluation. For example, shoveling and raking activity was matched to the gardening scenario. Assumptions about the duration and frequency of exposure may under- or overestimate actual exposure conditions for an individual. Other uncertainties include differences in actual weather conditions relative to conditions at the time of sampling and the amount of asbestos present in the soil.

Table 4 presents excess lifetime cancer risk estimates associated with the various exposure scenarios for arithmetic mean and maximum results from the activity-based sampling. Excess lifetime cancer risks represent the additional incremental cancer risk to an individual resulting from exposure to asbestos at the levels assumed in this memo. The representative or characteristic activities conducted at the site (moving sediment, mowing and raking, and walking) were based on previous ABS scenarios performed in 2006 along Swift Creek and also were developed in consultation with the landowners. These activities are representative of some, but not necessarily all potential exposures to Swift Creek dredged materials.

Breathing asbestos fibers can lead to adverse health effects, including diseases of the lungs. The diseases that are linked to airborne asbestos exposure most frequently include asbestosis, pleural changes, lung cancer and mesothelioma. EPA's cancer potency factor for asbestos is based on the occurrence of lung cancer and mesothelioma in people exposed to asbestos at their jobs (http://www.epa.gov/iris/subst/0371.htm). Smoking cigarettes can have a synergistic effect when combined with exposure to asbestos meaning that someone who smokes and is exposed to asbestos may be at greater than simply additive risk than someone who doesn't smoke.

Excess lifetime cancer risks were estimated by multiplying the exposure point concentration (i.e., PCME concentration measured from the personal samplers) by the time weighting factor and by the cancer potency factor for asbestos (see Appendix A). Note that use of the pooled mean versus the arithmetic mean did

not change the conclusions of this memorandum, hence only the arithmetic mean results were presented.

EPA typically considers cancer risks less than one in a million (e.g., 1×10^{-6}) acceptable, while cancer risks greater than one in ten thousand (i.e., 1×10^{-4}) generally require some level of response. An excess lifetime cancer risk of one in ten thousand is the upper bound of the range within which EPA's Superfund program generally selects cleanup goals for contaminated sites, with one in a million as the "point of departure," or level above which EPA begins to consider remedial options. However, use of one in ten thousand as an acceptable risk level is consistent with other asbestos sites, notably Libby, Montana (Weis 2001), and the World Trade Center site (COPC Work Group 2003).

The recent ABS field event demonstrated that asbestos fibers in flood deposits from Sumas River are released into the breathing zone when certain outdoor activities are conducted (EPA 2011). In most cases, the detected levels of fibers are not associated with risks greater than 1×10^{-4}; however, for some locations (Location 1 barn area and fields and corn field at Location 2) and some activities (e.g., farm-related soil work, and child play), risks generally exceed this range. Sampling was intentionally conducted during the warmer and drier summer months, when the air is generally dry; consequently, concentrations of fibers in air may be higher than during other times of the year. However, on the last day of sampling, it rained briefly. None of the risks for this location exceeded 1×10^{-4}, despite soil levels being similar to other locations that were sampled. This supports the recommendation to wet soils prior to conducting work to reduce exposures to airborne fibers, though the extent of exposure reduction is uncertain.

The stationary sampling results are generally about an order of magnitude (10 times) lower than the activity-based sampling results. This is generally consistent with measurements made at other sites. Risks were estimated for personal sampling results only as stationary sampling results do not adequately represent exposures to human receptors. This is because air monitoring for asbestos using activity-based sampling accounts for how people disturb the environment around them; stationary samplers do not account for people's personal dust cloud.

Asbestos was not readily observed by the naked eye in soil samples collected from properties where ABS was conducted; however, concentrations of chrysotile asbestos were elevated in most samples (0.5% to 17%) as determined using point counting by polarized light microscopy (PLM). These concentrations are higher than what was measured along the dredge piles adjacent to Swift Creek, where concentrations ranged from 0.1% to 4.4% (average 1.4%). These levels are relatively high compared to other sites with naturally occurring asbestos, notably the El Dorado Hills site in California (personal communication with Jere Johnson, Region 9 Site Assessment Manager, 2/6/2007) and Libby, Montana

(personal communication with Aubrey Miller, Region 8 Senior Medical Officer & Toxicologist, 2/6/2007).

Moisture content results are presented in Table 5. The moisture content in samples collected from Locations 1 and 2 when conditions were hot and dry averaged about 3.5%. The moisture content at Location 3 when it was raining and very humid averaged about 9%. Two samples collected along drainages were not included in these averages. The moisture content for the drainage at Location 1 was about 10% while the moisture content for the drainage at Location 2 was over 50%.

Meteorological data also was collected on each day when ABS was conducted. On the first two days, weather conditions were favorable with dry, warm weather. The average wind speed ranged from 0.38 m/s to 3.8 m/s, the average temperature ranged from 20.4ºC to 30.7ºC, and the relative humidity ranged from 30% to 72%. On the third day, the average wind speed ranged from 0 m/s to 0.8 m/s, the average temperature ranged from 14.6ºC to 17.8ºC, and the relatively humidity ranged from 65% to 91%. These data are shown in Appendix F of the Sampling Report (EPA 2011). The weather on the third day likely impacted air concentrations of asbestos during ABS at Location 3. This location had soil PLM concentrations of asbestos of about 12.5%, but the personal air sampling results were lower than observed at locations 1 and 2 where soil concentrations were similar (i.e., loafing shed, corn field).

Uncertainty Discussion

Risk evaluation is an uncertain process. At the Sumas Mountain Asbestos site, there are several uncertainties that may result in over- or underestimation of risk. These uncertainties are briefly described below and the possible impact on the risk calculations is provided.

- The weather has an important impact on the ABS results. Sampling was done when conditions were expected to be warm and dry so than a worst-case assessment of exposure could be performed. However, on the third day of sampling light rainfall resulted in lower ABS concentrations than were expected, given the asbestos content of the area where sampling was done. Given that exposures to asbestos near the Sumas Mountain landslide area occur over a variety of meteorological conditions, risk estimates presented in this memo for the warmer, drier days (i.e., at Locations 1 and 2) may overestimate long-term exposures.
- Wind speeds also are shown with the meteorological data presented in Appendix F of the Environmental Sampling Report (EPA 2011). The wind speeds during the sampling event were relatively low, indicating calm conditions, which tend to be worst-case (i.e., most conservative) for ABS. High wind speeds would tend to blow disturbed asbestos away from the person conducting the sampling.

- Only fibers that meet the PCME size requirement were included in the risk evaluation. Presumably, risk estimates based on this fiber size category account for exposures to other size categories. However, depending on the relative proportion of PCME fibers to the total number of asbestos structures, the actual risk could be higher or lower. For this sampling event, PCME fibers made up about 1-10% of the total number of asbestos structures. Many fibers were shorter and thinner than the PCME category.
- Increased respiration (e.g., breathing) while performing some activities could result in higher exposures than what was estimated for this risk evaluation.
- The activities approximate the types of exposures that may occur at the site and to site-related media, but people may do other activities – instead of or in addition to these. Risks associated with other activities were not assessed and may be higher or lower than those presented here.
- This risk evaluation did not estimate risks from exposures to materials that may have originated at Sumas Mountain/Swift Creek/Sumas River but were taken to other locations for use as fill. For similar activities, disturbing similar materials should result in similar risks.
- The risk evaluation considered only intermittent exposures for some activities. It is possible that residents or farm workers in impacted areas may experience more than one type of exposure. If so, risks could be additive. It is also possible that individuals that live near Sumas River or Swift Creek have exposures to asbestos from the dredged materials that have not been assessed in this memorandum. Additional exposure pathways may result in increases in excess lifetime cancer risk.
- The type of asbestos detected in samples collected at this site is predominantly chrysotile. A few samples had small amounts of amphibole (e.g., actinolite), but these amounts comprised only a very small percentage of the total number of fibers observed. Some scientists believe that chrysotile asbestos may be a less potent carcinogen than amphibole; however, the current EPA unit risk for asbestos does not differentiate between fiber type.

Recommendations/Conclusions

The risk evaluation indicates that for the activities and areas tested, cancer risks are in some cases above the high end of EPA's risk management range of 1 x 10^{-6} to 1 x 10^{-4}.

The practical implications of these findings are consistent with information EPA and the health agencies have provided to the community previously. Residents and farm workers should avoid contact with sediments from Swift Creek or the Sumas River in areas downstream of the slide area; avoid tracking sediments into homes or vehicles; and when in doubt, assume that flood deposits contain asbestos. If materials must be handled, this should be done when they are wet to

minimize release of fibers. Also respiratory protection, gloves, and coveralls should be used to limit exposures.

Cancer risks from asbestos exposure increase with the concentration of asbestos fibers in the air, the frequency and duration of exposure, and the time since first exposure.

The Whatcom County Health Department and the Washington State Department of Health have issued health advisories to help people limit their risks (see Appendix B). In areas where flooding or dredging may have carried sediments from Swift Creek or Sumas River to yards or indoor spaces, the health advisories list practices for reducing exposure.

Sediments containing asbestos may have been moved from dredge piles or flooded areas to other locations in the area. The extent and locations of such sediments is unknown. Because they are a potential additional source of asbestos exposure, the health advisories also provide information about testing of material suspected to have originated at the Sumas Mountain landslide, dredge piles, or riverbanks and nearby depressions.

Additional information on naturally occurring asbestos can be found on-line at the Agency for Toxics Substances and Disease Registry:
http://www.atsdr.cdc.gov/noa/

Another area where naturally occurring asbestos poses a health threat is Placer, CA. The following California Air Resources Board website contains some information about naturally occurring asbestos in that area that the Swift Creek/Sumas River community may find useful in understanding risks and ways to reduce exposure to asbestos: http://www.placer.ca.gov/Air/NOA.aspx

EPA's Sumas Mountain Asbestos Site website contains up-to-date information on site activities and recent findings:
http://yosemite.epa.gov/r10/cleanup.nsf/sites/swiftcreek

References:

Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Task Force Working Group, May 2003, World Trade Center Indoor Environment Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks.

International Organization for Standardization, 1995, Ambient Air – Determination of Asbestos Fibres – Direct-transfer Transmission Electron Microscopy Method, Reference No. ISO 10312:1995(E).

U.S. EPA, February 2011, Environmental Monitoring for Asbestos: Sumas Mountain Asbestos Site, Selected Residential Properties, Bulk Sampling and Analysis, Activity-Based Sampling, Surface Water Sampling, Whatcom County, Washington, prepared by Julie Wroble, Office of Environmental Assessment, EPA Region 10, Seattle, Washington.

U.S. EPA, August 2010a, Quality Assurance Project Plan (QAPP) for Activity Based Sampling and Analysis, Sumas Mountain Asbestos Site, Whatcom County, Washington, Revision 4.0.

U.S. EPA, August 2010b, Activity-Based Sampling Plan, Sumas Mountain Asbestos Site, Whatcom County, Washington, Revision 5.

U.S. EPA, September 2008, Framework for Investigating Asbestos-Contaminated Superfund Sites, OSWER Directive No. 9200.0-68, prepared by the Asbestos Committee of the Technical Review Workgroup, http://epa.gov/superfund/health/contaminants/asbestos/pdfs/framework_asbestos_guidance.pdf.

Weis, Christopher P. Ph.D., DABT, July 9, 2001, Memorandum to Paul Peronard, On-Scene Coordinator, Libby Asbestos Site, Fibrous Amphibole Contamination in Soil and Dust at Multiple Locations in Libby Poses an Imminent and Substantial Endangerment to Public Health: an Addendum to my Memorandum of May 10, 2000.

Table 1
Activity-Based Sampling Results
Sumas Mountin Asbestos Site
Whatcom County, Washington

Sample Number	Date	Description	No. PCME Fibers	Anal. Sens. (s/cc)	Hi Mag PCME conc	Straight Mean	Sum of Reciprocals	Pooled Mean	No. PCME Fibers	Anal. Sens. (s/cc)	Low Mag PCME conc	Straight Mean	Sum of Reciprocals	Pooled Mean	Notes
10344200	8/24/2010	Loc. 1, Walking in field, collecting samples	2	0.02362	0.04724	0.12	84.6740051	0.12	79	0.00094	0.07426	0.09	1918.530642	0.09	
10344201	8/24/2010	Loc. 1, Walking in field, collecting samples	8	0.02362	0.18896				88	0.00117	0.10296				
10344202	8/24/2010	Loc. 1, Loading, raking spreading	6	0.03058	0.18348	0.67	34.1096236	0.21	87	0.0023	0.2001	1.22	563.7195825	0.50	
10344203	8/24/2010	Loc. 1, Loading, raking spreading	0	1.9576	0				54	0.0196	1.0584				analyzed indirectly
10344204	8/24/2010	Loc. 1, Loading, raking spreading	1	2.4832	2.4832				54	0.0248	1.3392				analyzed indirectly
10344205	8/24/2010	Loc. 1, Loading, raking spreading	0	2.0203	0				86	0.0266	2.2876				analyzed indirectly
10344210	8/25/2010	Loc. 2, raking/mowing lawn near house	4	0.0012	0.0048	0.005	1448.86477	0.0041	4	0.00088	0.00352	0.004	3287.896314	0.0043	
10344211	8/25/2010	Loc. 2, raking/mowing lawn near house	1	0.0083	0.0083				8	0.00091	0.00728				
10344212	8/25/2010	Loc. 2, raking/mowing lawn near house	1	0.00202	0.00202				2	0.00095	0.0019				
10344206	8/25/2010	Loc. 2, raking/mowing lawn near shed	4	0.01514	0.06056	0.021	1091.55953	0.0064	18	0.00136	0.02448	0.009	1490.351081	0.0134	
10344207	8/25/2010	Loc. 2, raking/mowing lawn near shed	3	0.00099	0.00297				2	0.00136	0.00272				
10344209	8/25/2010	Loc. 2, raking/mowing lawn near shed	0	0.0649	0				0	0.0506	0				analyzed indirectly
10344213	8/25/2010	Loc. 2, walking in corn field	1	0.01781	0.01781	0.028	172.965918	0.029	36	0.00088	0.03168	0.028	3253.29912	0.028	
10344208	8/25/2010	Loc. 2, duplicate of 10344213	1	0.03205	0.03205				45	0.00096	0.0432				
10344214	8/25/2010	Loc. 2, walking in corn field	3	0.01168	0.03504				11	0.00093	0.01023				
10344215	8/26/2010	Loc. 3, raking along river	1	0.01465	0.01465	0.0074	540.863664	0.0055	19	0.00088	0.01672	0.0079	5254.010695	0.0074	
10344216	8/26/2010	Loc. 3, raking along river	1	0.00946	0.00946				8	0.00085	0.0068				
10344217	8/26/2010	Loc. 3, raking along river	0	0.00524	0				6	0.00068	0.00408				
10344218	8/26/2010	Loc. 3, duplicate of 10344217	1	0.00568	0.00568				6	0.00068	0.00408				

Table 2
Stationary Air Sampling Results
Sumas Mountain Asbestos Site
Whatcom County, Washington

Sample Number	Date	Description	No. PCME Fibers	Anal. Sens. (s/cc)	Hi Mag PCME conc	Straight Mean	Sum of Reciprocals	Pooled Mean	Notes
10344222	8/24/2010	Loc. 1	1	0.0001	0.0001	0.016	10786.23589	0.00074	
10344223	8/24/2010	Loc. 1	2	0.003	0.006				
10344224	8/24/2010	Loc. 1	1	0.00263	0.00263				
10344225	8/24/2010	Loc. 1	4	0.01376	0.05504				
10344227	8/24/2010	Loc. 1 - near/in loafing shed	0	0.9105	0	0.29	50.7999446	0.079	analyzed indirectly
10344228	8/24/2010	Loc. 1 - near/in loafing shed	3	0.02064	0.06192				
10344229	8/24/2010	Loc. 1 - near/in loafing shed	1	0.7987	0.7987				analyzed indirectly
10344230	8/25/2010	Loc. 2, stationary near house	0	0.00076	0	0.00092	11431.53021	0.00044	
10344231	8/25/2010	Loc. 2, stationary near house	2	0.00135	0.0027				
10344232	8/25/2010	Loc. 2, stationary near house	0	0.00016	0				
10344233	8/25/2010	Loc. 2, stationary near house	3	0.00032	0.00096				
10344234	8/25/2010	Loc. 2, stationary near shed	2	0.00121	0.00242	0.00078	8109.718564	0.00049	
10344235	8/25/2010	Loc. 2, stationary near shed	0	0.00028	0				lots of very small fibers present
10344236	8/25/2010	Loc. 2, stationary near shed	2	0.00035	0.0007				
10344237	8/25/2010	Loc. 2, stationary near shed	0	0.00117	0				
10344238	8/26/2010	Loc. 3, stationary along river	0	0.00099	0	0.00025	4040.40404	0.00025	
10344239	8/26/2010	Loc. 3, stationary along river	1	0.00099	0.00099				
10344240	8/26/2010	Loc. 3, stationary along river	0	0.00099	0				
10344241	8/26/2010	Loc. 3, stationary along river	0	0.00099	0				

Table 3 Time Weighting Factors

Scenario	Hours/day	Days/year	Years	TWF	LTL-UR	
Walking	1	156	30	0.018	0.06	Exposure begins at 25 and continues for 30 years
Child Play - Low	1	100	10	0.011	0.078	Exposure begins at age 2 and continues for 10 years
Child Play - High	2	350	10	0.080	0.078	Exposure begins at age 2 and continues for 10 years
Farming - periodic field work	12	10	40	0.014	0.09	Exposure begins at 18 and continues for 40 years
Farming - daily activities	2	250	40	0.057	0.09	Exposure begins at 18 and continues for 40 years
Gardening - Low	2	50	30	0.011	0.06	Exposure begins at 25 and continues for 30 years
Gardening - High	10	50	30	0.057	0.06	Exposure begins at 25 and continues for 30 years

Key:
LTL-UR = less-than-lifetime unit risk derived from Appendix E of EPA's Framework for Investigating Asbestos-Contaminated Superfund Sites (EPA 2008)
TWF = Time-weighting factor

Table 4 Activity-Specific Excess Lifetime Cancer Risks

			Assumed Exposure Pathways						
Activity-Based Sampling Location and Activity	**Description**	**Low Mag PCME conc**	**Gardening - Low**	**Gardening - High**	**Walking**	**Farming - periodic field work**	**Farming - Daily Activities**	**Child Play - Low**	**Child Play - High**
Loc. 1, Walking in field, collecting samples	Maximum	0.10296			**1.1E-04**			**9.2E-05**	**6.4E-04**
	Straight Mean	0.09			**9.6E-05**			**8.0E-05**	**5.6E-04**
Loc. 1, Loading, raking spreading	Maximum	2.2876	**1.6E-03**	**7.8E-03**		**2.8E-03**	**1.2E-02**	**2.0E-03**	**1.4E-02**
	Straight Mean	1.22	**8.4E-04**	**4.2E-03**		**1.5E-03**	**6.3E-03**	**1.1E-03**	**7.6E-03**
Loc. 2, raking/mowing lawn near house	Maximum	0.00728	**5.0E-06**	**2.5E-05**				**6.5E-06**	**4.5E-05**
	Straight Mean	0.004	**2.7E-06**	**1.4E-05**				**3.6E-06**	**2.5E-05**
Loc. 2, raking/mowing lawn near shed	Maximum	0.02448	**1.7E-05**	**8.4E-05**				**2.2E-05**	**1.5E-04**
	Straight Mean	0.009	**6.2E-06**	**3.1E-05**				**8.0E-06**	**5.6E-05**
Loc. 2, walking in corn field	Maximum	0.0432			**4.6E-05**	**5.3E-05**	**2.2E-04**		
	Straight Mean	0.028			**3.0E-05**	**3.5E-05**	**1.4E-04**		
Loc. 3, raking along river	Maximum	0.01672	**1.1E-05**	**5.7E-05**	**1.8E-05**	**2.1E-05**		**1.5E-05**	**1.0E-04**
	Straight Mean	0.0079	**5.4E-06**	**2.7E-05**	**8.4E-06**	**9.7E-06**		**7.0E-06**	**4.9E-05**

Note: Yellow Highlight indicates risks exceeding EPA's acceptable risk range of 1E-06 to 1E-04
1E-06 = 0.000001 = 1 in a million
1E-04 = 0.0001 = 1 in ten thousand

Table 5
Moisture Content for Soil Samples
Sumas Mountain Asbestos Site
Whatcom County, Washington

Sample No.	Location	Soil Moisture (%)
MJCSD1	Loc. 1, Along River, composite from wheelbarrow	4.60%
MJCSE2	Loc. 1, Along River, composite from wheelbarrow (duplicate)	2.80%
MJCSD2	Loc. 1, Loafing Shed, composite	4.20%
MJCSD3	Loc. 1, Along Drainage composite	10.10%
MJCSD4	Loc. 2, Lawn Near House, composite	2.20%
MJCSD5	Loc. 2, Lawn Near Shop, composite	3.70%
MJCSD6	Loc. 2 Corn Field, composite	3.20%
MJCSE3	Loc. 2 Corn Field, composite (duplicate)	3.40%
MJCSE4	Loc. 2 Corn Field grab	4.30%
MJCSD7	Loc. 2, Drainage along Gillies Rd.	53.10%
MJCSD8	Loc. 3, Riverside	7.90%
MJCSE6	Loc. 3, Riverside (duplicate)	2.90%
MJCSD9	Loc. 3, Yard composite	9.90%
MJCSE0	Loc. 3, north side of house	15.10%
MCJSE1	Loc. 3, drip line along greenhouse	8.90%

APPENDIX A

INPUTS FOR RISK CALCULATIONS
ACTIVITY-BASED SAMPLING ACTIVITIES

APPENDIX A

INPUTS FOR RISK CALCULATIONS
ACTIVITY-BASED SAMPLING ACTIVITIES

1.0 Basic Equations

Risk from inhalation exposure to asbestos fibers may be calculated using the following basic equation:

$$Risk = C * UR_{LTL} * TWF$$

Where:

C = Concentration of fibers in air (s/cc)
UR_{LTL} = Unit Risk (risk per f/ml or risk per s/cc) from the Lifetable approach presented in Appendix E (EPA 2008)
TWF = time-weighting factor (fraction of lifetime during which exposure occurs)

2.0 Inputs for Calculation of Excess Lifetime Cancer Risk

Each of the three input parameters needed to calculate the excess lifetime cancer risk is discussed below, along with the resulting values.

Concentration
The concentration of asbestos fibers in air was determined based on activity-based sampling measurements made during August 2010 at the Sumas Mountain Asbestos site. For each of the activities conducted, a mean and maximum concentration was determined. These concentrations were used to calculate risk for certain site-related activities.

Unit Risk
The unit risk is a measure of the cancer potency of a given substances. For asbestos, EPA's integrated risk information system (IRIS) identifies a unit risk of 0.23 per PCM fiber per ml (http://www.epa.gov/iris/subst/0371.htm). However, EPA's Framework for Investigating Asbestos-Contaminated Superfund Sites provides a lifetable approach in Appendix E that was used for risk estimation purposes in this memo (http://epa.gov/superfund/health/contaminants/asbestos/pdfs/framework_asbestos_guidance.pdf). Note that the lifetable approach requires assumptions about the age at which exposure begins and the duration of exposure. These assumptions are provided in the table below.

Time-Weighting Factor
The TWF is the fraction of a year during which exposure occurs. This depends on the assumed time and frequency of exposure. For the purposes of these calculations, the following assumptions were used:

Activity	Exposure Time (hr/day)	Exposure Frequency (d/year)	Total hours	TWF	Assumption
Total	24	365	8760	1.00	
Walking	1	156	156	0.0178	Exposure begins at age 25 an continues for 30 years

Child Play – Low Frequency	1	100	100	0.011	Exposure begins at age 2 and continues for 10 years
Child Play – High Frequency	2	350	700	0.080	Exposure begins at age 2 and continues for 10 years
Farming – Periodic exposure	12	10	120	0.014	Exposure begins at age 18 and continues for 40 years
Farming – Daily Activities	2	250	500	0.057	Exposure begins at age 18 and continues for 40 years
Gardening – Low	2	50	100	0.011	Exposure begins at age 25 and continues for 30 years
Gardening – High	10	50	500	0.057	Exposure begins at age 25 and continues for 30 years

Note that these assumptions may not be identical to the activities actually conducted at the site. Rather, these were selected to represent generally conservative estimates of the actual exposures associated that may occur. These assumptions are based on upper percentile values presented in EPA's Exposure Factors Handbook (EPA 1997).

Briefly, the values selected for these scenarios were based on the following references:

Walking: Best professional judgment was used to estimate the time-weighting factor for walking. An individual was assumed to walk for one hour per day, 3 days per week, for the entire year.

Child Play: For the High Frequency scenario, the 90th percentile value of 120 minutes/d for children ages 1-11 was used for the exposure time (Exposure Factors Handbook, Table 15-58). The exposure frequency of 350 days per year assumes children play out doors every day except for 2 weeks that they may be on vacation away from home. The entire span of the age group was used for exposure duration. For the Low Frequency scenario, one hour a day for 100 days per year was assumed based on best professional judgment.

Farming: For the periodic exposure, farmers were assumed to work with soil contaminated with asbestos for 12 hours per day, 10 days per year, for 40 years. Based on conditions observed during the field event, for daily activities farmers were assumed to work with asbestos-contaminated soil for 2 hours per day, 250 days per year, for 40 years. The 40-year exposure duration for farmers is consistent with EPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, which has a farmer scenario (http://www.epa.gov/osw/hazard/tsd/td/combust/riskvol.htm#volume1).

Gardening: The high scenario is based on the 95th percentile value for hours per month that adults garden as provided in EPA's Exposure Factors Handbook, Table 15-62, combined with the standard EPA residential exposure duration. The low gardening activity is based on best professional judgment and is one fifth the assumed exposure time as the high gardening scenario.

APPENDIX B

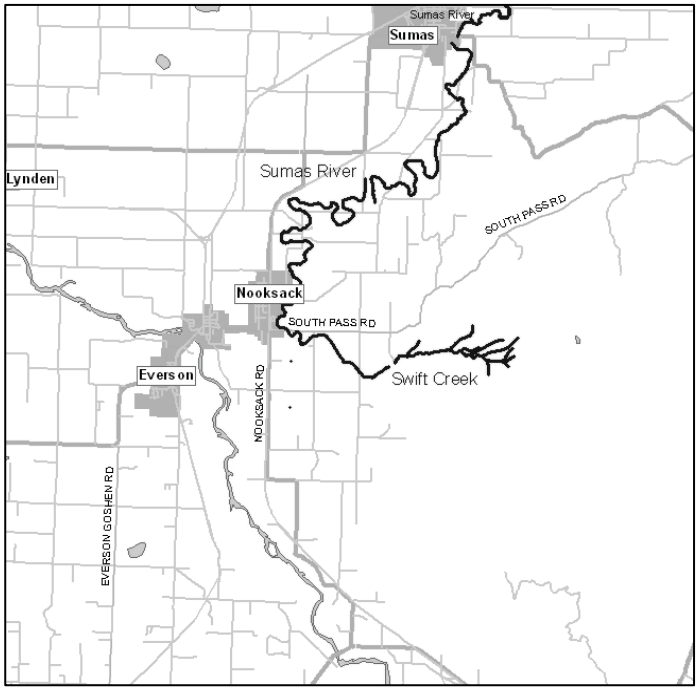
HEALTH ADVISORIES

September 2008, Publication No. 334-162

Advisory for Swift Creek Naturally Occurring Asbestos

Why is there an advisory about naturally occurring asbestos in Swift Creek?

Swift Creek, which flows into the Sumas River, has recently been found to contain high levels of naturally occurring asbestos. The asbestos is in the water and in the riverbed sediment and may become airborne when people disturb the ground by walking, cycling, or riding horses on the creek banks or dredge piles. The asbestos may also become airborne if sediment from the riverbed is used for home construction projects, such as driveways or pathways. When asbestos becomes airborne, it can be breathed into the lungs. Breathing asbestos from Swift Creek sediment can increase the risk of developing asbestos related disease.



Location of asbestos deposits (bold areas)

What is naturally occurring asbestos, and how much is in Swift Creek?

Naturally occurring asbestos is a fibrous mineral that may be found in certain types of rock or soil. The source of the asbestos in Swift Creek is an area on Sumas Mountain that is eroding. As this area erodes, the asbestos is deposited along with sediment into Swift Creek. Most of the asbestos found in Swift Creek is a type of asbestos called *chrysotile*, which is the type of asbestos most commonly used in commercial products, such as brake linings. These asbestos fibers sometimes make the water in Swift Creek appear white in color. Studies of Swift Creek, conducted by the Environmental Protection Agency (EPA), indicate that samples of the riverbed sediment average just under 2% asbestos, and range up to over 4% asbestos. Samples of the dried white layers on the creek banks have been found to contain up to 43% asbestos. Asbestos that does not settle out in the Swift Creek riverbed is carried into the Sumas River.

How can naturally occurring asbestos affect my health?

Exposure to asbestos occurs when airborne asbestos fibers are inhaled through breathing and the fibers enter the lungs. In some cases, when significant exposure to asbestos has occurred, the fibers can damage the lungs or the membranes that cover the lungs. Breathing asbestos may cause the development of asbestos related disease such as lung cancer, mesothelioma, or asbestosis. Mesothelioma is a rare cancer caused by asbestos and occurs in the lung covering or in the lining of the abdominal cavity. Asbestosis is a scarring of the lungs that decreases the lungs ability to function. Pleural plaques can also develop, which are characterized by a thickening and hardening of the lining that covers the lungs and chest cavity, and are a sign of asbestos exposure.

Will I get asbestos related disease if I have been exposed to naturally occurring asbestos?

Being exposed to asbestos does not necessarily mean that a person will develop asbestos related disease. There are many factors that contribute to the risk of developing disease. The most important of these are:

- How long and how frequently a person was exposed to asbestos.
- How long it has been since the exposure to asbestos.
- The amount of asbestos a person was exposed to.
- The size and type of asbestos a person was exposed to.
- Whether or not a person smokes cigarettes, since asbestos exposure increases the chances of a person who smokes getting lung cancer.
- Whether or not other pre-existing lung conditions are present.

In most cases, people who develop asbestos related disease do not show signs or symptoms of these diseases until at least 10 to 20 years after they were exposed to asbestos. Some asbestos is found in air, in background concentrations, from the use of commercial products such as brake pad linings, insulation, or roofing shingles. Asbestos was banned from use in the late 1970s in drywall, popcorn ceilings, tile mastic and other products commonly found in older homes. Since the exact level of exposure to asbestos that may result in disease is not known, it is important to minimize additional exposures to asbestos.

What should I do if I have sediment from Swift Creek on my property?

The risk of developing asbestos related disease is lower if exposure to asbestos is reduced. If sediment from Swift Creek was used for a home construction project, the following steps can help reduce exposure:

- Pave or cover unpaved walkways, driveways, or roadways. The cover should be thick enough to prevent disturbance of asbestos-contaminated sediment during routine uses or activities.
- Cover known Swift Creek sediments in gardens and yards with asbestos-free soil or landscape covering. The cover should be thick enough to prevent disturbance of asbestos-contaminated soil during routine uses or activities.
- Pre-wet garden (or agricultural) areas before digging, shoveling, or disturbing soil.
- Try to keep pets from carrying dust or dirt on their fur or feet into the home by keeping them out of areas where asbestos may be present. If they do get dirty, bathe the pet (brushing can release fibers into the air).
- Remove shoes before entering homes or other buildings to prevent tracking-in dirt.
- Use doormats to lower the amount of soil that is tracked into the home.
- Keep windows and doors closed on windy days and during nearby construction.
- Use a wet rag instead of a dry rag or duster to dust.
- Use a wet mop on non-carpeted floors.
- Use washable area rugs on floors and wash them regularly.
- Vacuum carpets often using a vacuum with a high efficiency HEPA filter.
- Install a HEPA quality filter in forced air furnace systems.

Can I test the sediment on my property to see if it contains naturally occurring asbestos?

If you believe that sediment from Swift Creek was used on your property, you may test the sediment to determine if it contains asbestos. The EPA currently recommends that testing for asbestos be done using a method called Polarized Light Microscopy (commonly known as PLM). Generally, levels of asbestos fibers in Swift Creek sediment should be detected by this method. Although PLM cannot measure asbestos very well when fibers are present at very low levels, PLM is the most suitable testing method available. To determine if the sediment on your property contains asbestos, contact an asbestos consultant or laboratory listed in your Yellow Pages under "Asbestos Consulting and Testing." Ask for specific instructions on safely collecting sediment samples for testing and for interpretation of test results.

What is being done to manage the naturally occurring asbestos in Swift Creek?

Swift Creek is dredged annually in order to prevent flooding. The dredged sediment containing the naturally occurring asbestos is stockpiled on the banks of the creek. Currently, because of the high levels of asbestos that have been detected in the sediment, removal of the sediment for construction purposes or any use is prohibited. Local, state and federal agencies are working to determine the best and safest methods for managing the sediment. Additional Swift Creek site information can be found on the EPA website at http://yosemite.epa.gov/r10/cleanup.nsf/sites/swiftcreek .

Where can I get more information about health issues and asbestos in Swift Creek?

Washington Department of Health March, 2006 Health Consultation report on Swift Creek at: http://www.doh.wa.gov/ehp/oehas/publications_pdf/HealthConsults/swiftcreekasbestos.pdf

Washington Department of Health February, 2008 Health Consultation report on Swift Creek at: http://www.doh.wa.gov/ehp/oehas/publications_pdf/HealthConsults/0802swiftcreek.pdf

Agency for Toxic Substances and Disease Registry website at: http://www.atsdr.cdc.gov/NOA/index.html

Local information about Swift Creek, including the scheduling of upcoming public meetings, is available at the Whatcom County website at: http://www.whatcomcounty.us/health/eh/index.jsp

Who can I call if I have questions about how Swift Creek asbestos may affect my health?

Questions about health concerns from naturally occurring asbestos in Swift Creek may be directed to:

Jeff Hegedus
Environmental Health Supervisor
Whatcom County Health Department
360-676-6724 ext 50895
jhegedus@co.whatcom.wa.us

Barbara Trejo
Health Assessor/ Hydrogeologist
Washington State Department of Health
Office of Environmental Health Assessments
Toll free: 1-877-485-7316
barbara.trejo@doh.wa.gov

Karen Larson, Ph.D.
Toxicologist
Agency for Toxic Substances and Disease Registry
206-553-6978
KXL5@cdc.gov

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND HEALTHIER COMMUNITY

Whatcom County Health Department
509 Girard Street
Bellingham, WA 98225-4005

Washington State Department of Health
Division of Environmental Health
Office of Environmental Health Assessments

July 2009, Publication No. 334-211

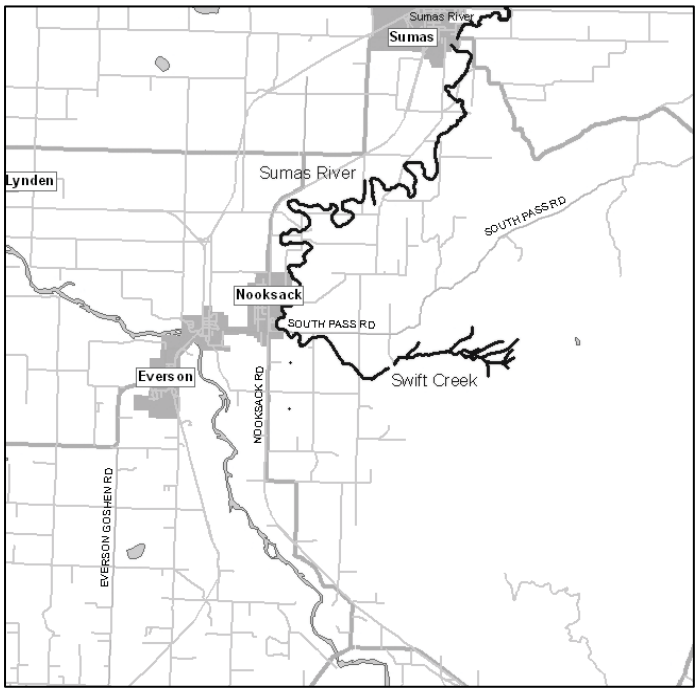
Advisory for Naturally Occurring Asbestos in the Northern Part of the Sumas River

Why is there an advisory about naturally occurring asbestos in the Sumas River?

Recent U.S. Environmental Protection Agency (EPA) sampling confirms that Swift Creek asbestos has traveled into the northern portion of the Sumas River. This has occurred between the point where Swift Creek enters the river and the Canadian border. High levels of asbestos have been found in the water and the sediments deposited next to the river. It has also been found in some upland soils near the river where flooding occurred in winter 2008-2009.

Asbestos may become airborne when people disturb the ground by walking, digging, plowing, riding horses or bikes, or otherwise disturbing the ground. The asbestos may also become airborne if sediment from the riverbed is used for home, farm, or other types of construction projects, such as driveways or pathways.

When asbestos becomes airborne, people may breathe it into their lungs. Breathing asbestos can increase the risk of developing asbestos related disease.



Location of asbestos deposits (bold areas)

What is naturally occurring asbestos, and how much is in the Sumas River?

Naturally occurring asbestos is a fibrous mineral that may be found in certain types of rock or soil. Most of the asbestos found in this area is a type of asbestos called *chrysotile* — the type of asbestos most commonly used in commercial products, such as brake linings. The asbestos is coming from an area that is eroding on Sumas Mountain. As this area erodes, the asbestos-containing sediment travels into Swift Creek. Asbestos that does not settle-out in Swift Creek is may be carried into the Sumas River. These asbestos fibers sometimes make the water appear white. Recent studies of the Sumas River, conducted by the EPA, show that sediments along the bank contained from about 2 to 23 percent asbestos while the upland samples collected in some of the 2008-2009 flooded areas have about 0.5 to 27 percent asbestos. These levels exceed drinking water standards set by EPA.

How can naturally occurring asbestos affect my health?

Exposure to asbestos occurs when airborne asbestos fibers are inhaled through breathing and the fibers enter the lungs. In some cases, when significant exposure to asbestos has occurred, the fibers can damage the lungs or the membranes that cover the lungs. Breathing asbestos may cause asbestos-related diseases such as lung cancer, mesothelioma, or asbestosis. Mesothelioma is a rare cancer caused by asbestos and occurs in the lung covering or in the lining of the abdominal cavity. Asbestosis is a scarring of the lungs that decreases the lungs ability to function. Pleural plaques can also develop, which are characterized by a thickening and hardening of the lining that covers the lungs and chest cavity, and are a sign of asbestos exposure.

Will I get asbestos-related disease if I have been exposed to naturally occurring asbestos?

Being exposed to asbestos does not necessarily mean that a person will develop asbestos-related disease. There are many factors that contribute to the risk of developing disease. The most important of these are:

- How long and how frequently a person was exposed to asbestos.
- How long it has been since the exposure to asbestos.
- The amount of asbestos a person was exposed to.
- The size and type of asbestos a person was exposed to.
- Whether or not a person smokes cigarettes, since asbestos exposure increases the chances of a person who smokes getting lung cancer.
- Whether or not other pre-existing lung conditions are present.

In most cases, people who develop asbestos-related disease do not show signs or symptoms of these diseases until at least 10 to 20 years or more after they were exposed to asbestos. Some asbestos is found in air, in background concentrations, from the use of commercial products such as brake pad linings, insulation, or roofing shingles. Asbestos was banned for use in the late 1970s in drywall, popcorn ceilings, tile mastic, and other products commonly found in older homes. Since the exact level of exposure to asbestos that may result in disease is not known, it is important to minimize additional exposures to asbestos.

What should I do if I have sediment from the Sumas River on my property?

The risk of developing asbestos-related disease is lower if exposure to asbestos is reduced. If sediment from the Sumas River is on your property, or was used for home, farm, or other types of construction projects, the following steps can help reduce exposure:

- Pave or cover unpaved walkways, driveways, or roadways. The cover should be thick enough to prevent disturbance of asbestos-contaminated sediment during routine uses or activities.
- Cover known Sumas River sediments in gardens and yards with asbestos-free soil or landscape covering. The cover should be thick enough to prevent disturbance of asbestos-contaminated soil during routine uses or activities.
- Avoid working or playing in or next to the river or areas with flood deposits.
- Minimize soil disturbing activities.
- Pre-wet garden or agricultural areas before digging, shoveling, or disturbing soil.
- Try to keep pets from carrying dust or dirt on their fur or feet into the home by keeping them out of areas where asbestos may be present. If they do get dirty, bathe the pet (brushing can release fibers into the air).
- Remove shoes before entering homes or other buildings to prevent tracking-in dirt.
- Use doormats to lower the amount of soil that is tracked into the home.
- Keep windows and doors closed on windy days and during nearby construction.
- Use a wet rag instead of a dry rag or duster to dust.
- Use a wet mop on non-carpeted floors.
- Use washable area rugs on floors and wash them regularly.
- Vacuum carpets often using a vacuum with a high efficiency HEPA filter.
- Install a HEPA quality filter in forced air furnace systems.

Can I test the sediment on my property to see if it contains naturally occurring asbestos?

If you believe that sediment from Swift Creek or the Sumas River was used on your property, you may test the sediment to determine if it contains asbestos. The EPA currently recommends that testing for asbestos be done using a method called Polarized Light Microscopy (commonly known as PLM). Generally, the levels of asbestos fibers in these sediments should be detected by this method. Although PLM cannot measure asbestos very well when fibers are present at very low levels, PLM is the most suitable testing method available. To determine if the sediment on your property contains asbestos, contact an asbestos consultant or laboratory listed in your Yellow Pages under "Asbestos Consulting and Testing." Ask for specific instructions on safely collecting sediment samples for testing and for interpretation of test results.

Where can I get more information about health issues and Swift Creek naturally occurring asbestos?

Washington Department of Health March, 2006 Health Consultation report on Swift Creek at:
http://www.doh.wa.gov/ehp/oehas/publications_pdf/HealthConsults/swiftcreekasbestos.pdf

Washington Department of Health February, 2008 Health Consultation report on Swift Creek at:
http://www.doh.wa.gov/ehp/oehas/publications_pdf/HealthConsults/0802swiftcreek.pdf

Agency for Toxic Substances and Disease Registry website at: http://www.atsdr.cdc.gov/NOA/index.html

Local information about Swift Creek, including the scheduling of upcoming public meetings, is available at the Whatcom County website at: http://www.whatcomcounty.us/health/eh/index.jsp

Additional Swift Creek site information can be found on the EPA website at:
http://yosemite.epa.gov/r10/cleanup.nsf/sites/swiftcreek

Who can I call if I have questions about how asbestos in the Sumas River may affect my health?

Questions about health concerns from naturally occurring asbestos in the Sumas River may be directed to:

Jeff Hegedus
Environmental Health Supervisor
Whatcom County Health Department
360-676-6724 ext 50895
jhegedus@co.whatcom.wa.us

Barbara Trejo
Health Assessor/ Hydrogeologist
Washington State Department of Health
Office of Environmental Health Assessments
Toll free: 1-877-485-7316
barbara.trejo@doh.wa.gov

Karen Larson, Ph.D.
Toxicologist
Agency for Toxic Substances and Disease Registry
206-553-6978
KXL5@cdc.gov

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND HEALTHIER COMMUNITY

Whatcom County Health Department
509 Girard Street
Bellingham, WA 98225-4005

Washington State Department of Health
Division of Environmental Health
Office of Environmental Health Assessments